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ABSTRACT

This paper utilizes individual institutional level data upon which the published American Association of University Professors (AAUP) salary survey results are based to compute continuation rates for associate professors during the 1996-97 and 2001-02 period. It summarizes the levels of continuation rates, by institutional category and public/private form of control during the period, and it uses AAUP institutional level data and data from other sources to estimate continuation rate equations. A key concern of the paper is the level of average faculty compensation at an institution and its effect on professorial turnover. Data analysis indicates that associate professor continuation rates are positively associated with the average level of compensation that associate professors receive. Holding other factors constant, including the public/private control of an institution, unionization of faculty, and highest degree that the institution grants, a $10,000 increase in associate professor compensation is related to a 0.5-0.8 percentage point increase in its associate professor continuation rate and thus an equivalent decline in its associate professor turnover rate. (SM)

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Associate Professor Turnover in American Colleges and Universities

By

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I. Introduction

Voluntary departures of tenured faculty prior to normal retirement ages from an academic institution provide both benefits and costs to an institution of higher education. The benefits include the freeing up of salary dollars that allow an institution to hire younger faculty members, the ability to reallocate resources across program areas, and to provide the opportunity for the institution to diversify its faculty along gender, race and ethnic lines. The costs include disruptions and loss of continuity in teaching and research programs, in graduate and undergraduate advising, and in departmental and institutional governance and cohesiveness. Moreover, the size of the start-up package per faculty member that research universities incur when they must replace departing senior scientists and engineers by new assistant professors is now often in the $300,000 to $500,000 range.[1]

Each academic institution should weigh these benefits and costs relative to its own needs to discern the own optimum level of voluntary turnover among its tenured faculty. To do so, an institution needs to understand the determinants of its tenured faculty turnover rate, as well as to have information on trends in turnover rates nationwide. While no national data on turnover rates of tenured faculty is published, each year the American Association of University Professors (AAUP), as part of its annual salary survey, collects information at the institutional level on the number of *continuing faculty members* in each rank. Continuing faculty members are defined as full-time faculty members employed in the rank in the previous year that also are employed full-time at the institution in the current year, regardless of their ranks in the current year. So for example, a faculty member who is an associate professor one year and promoted to

[1] Ehrenberg, Rizzo and Jakubson (2002)

full professor in the second year is counted as a continuing associate professor in the second year.

Subject to some qualifications, information on the number of continuing faculty members at an institution in a rank one year, coupled with information on the number of faculty members at the institution in the rank in the previous year, allows one to compute a *continuation rate* for faculty members in the rank at the institution. This is done by dividing the number of continuing faculty members in the rank in one year by the total number of faculty members in the rank in the previous year.[2] For example, the associate professor continuation rate is given by equation (1)

$$(1)\ CR_{It} = \frac{cont_assofac_{It}}{total_assofac_{It-1}},$$

where CR_{It} is the continuation rate for associate professors at institution I in year t, $cont_assofac_{It}$ is the number of continuing full-time associate professors at the institution in year t, and $total_assocfac_{It-1}$ is the total number of full-time associate professors at the institution in year $t-1$.

The institution's turnover rate of full-time associate professors T_{It} is simply one minus its continuation rate or,

$$(2)\ T_{It} = 1 - CR_{It}.$$

The continuation rate for assistant professors cannot be used as a measure of voluntary turnover for assistant professors because some assistant professors leaving an institution do so involuntarily when they are turned down for tenure. Similarly the continuation rate for full-professors is "contaminated" by faculty departures due to

[2] The qualifications relate to the treatment of faculty members who are serving as administrators or who are on leave in either the previous or current year. The presence of such individuals introduces possible measurement error into the calculation.

retirement, disability or death. It is fair to assert that the continuation rate for associate professors, most of whom are tenured faculty members, comes closest to approximating a measure of voluntary turnover that is likely to be influenced by characteristics that are most under the control of the institution, including its average faculty compensation level.

This paper makes use of the individual institutional level data upon which the published AAUP salary survey results are based to compute continuation rates for associate professors during the 1996-97 to 2001-2002 period.[3] The next section of the paper summarizes the levels of the continuation rates, by institutional category and public/private form of control during the period. Section III uses the AAUP institutional level data and data from other sources to estimate continuation rate equations. A key concern of this paper, as well as to college and university administrators, is the level of average faculty compensation at an institution and its effect on professorial turnover. The last section of this paper presents some brief concluding remarks.

II. Aggregate Faculty Continuation Rates, 1996-1997 to 2001-2002

While the vast majority of academic institutions report salary level data by rank to the AAUP each year, the number reporting continuing faculty data is much smaller and varies across years. In addition, each year a number of institutions report a number for continuing faculty that is larger than the number of faculty they reported in total in the previous year; these observations had to be eliminated from the sample.

Appendix Table 1 indicates the total number of institution/year observations in the original AAUP data set, broken down by type of control (public or private) and highest degree granted (PhD, Masters, Bachelors, Two-year). The table also shows the

[3] Ehrenberg, Kasper and Rees (1991) have previously used the AAUP data to study continuation rates of associate professors during the 1970s and 1980s.

number of observations available in what is called the *variable sample*; a sample that includes all possible institution/year observations that contain good continuation rate data. Finally, it indicates the number of observations available in the *constant sample*; a sample in which institutions must have reported good continuation rate data each year to be included. Computed continuation rates are very similar each year, by institutional category and form of control, between the two samples and results are only reported for the constant sample in this section to minimize concerns that the results may have been driven by the changing nature of the variable sample.[4]

One of the findings of Ehrenberg, Kasper, and Rees (1991) was how stable the aggregate continuation rates remained over the course of the1971 –1972 to 1988-1989 period. For all institutions and years in that study, the weighted (by faculty size) mean continuation rate across institutions was 0.917, with a maximum of 0.93 in 1986-1987 and a minimum of 0.90 in 1971-1972.[5] This paper's findings indicate that the aggregate continuation rate for associate professors continued to be remarkable stable during the 1996-97 to 2001-2002 period. For the constant sample of institutions, the mean of the continuation rate during the six years was .916. The mean of continuation rate began at .923 in 1996-97 and fell slightly to .908 by 2001-2002.

Figures 1, 2 and 3 plot the weighted (by number of faculty) average associate professor continuation rates for each of the 6 years for doctoral level, masters level and bachelors level institutions, in each case broken down by public and private form of control. The average continuation rate for private doctoral degree granting institutions was greater than that for their public counterparts in each year. Similarly, except for one

[4] Results for the continuous sample are available from the authors.
[5] Ehrenberg, Kasper, and Rees (1991).

year each, when the rates for public and private institutions were approximately equal, the average continuation rates for private bachelors and masters degree granting institutions were greater each year than the average continuation rates for their public counterparts. While one cannot infer causation from these simple comparisons, it is well known that average salaries of faculty at public higher education institutions were substantially lower than the average salary of faculty at private higher institutions during the period.[6] Hence these findings do suggest that one possible cost of public higher education institution's low relative faculty salaries may be the higher levels of associate professor turnover that they experience.

III. The Determinants of Associate Professor Continuation Rate

Data from both the continuous sample and the variable sample is used to estimate the determinants of associate professor continuation rates. Data for all institution/year observations between 1996-97 and 2001-2002 for which good continuation rate data are available is used in each case. For each sample, both weighted linear probability function models - whose coefficients are easy to interpret, and weighted log odds models - which have the advantage of constraining the predicted probabilities that are estimated to vary between 0 and 1 and of having normally distributed error terms, are used.

In the linear probability function model, the continuation rate for institution I in year t, CR_{It}, is specified to be linearly related to a constant, α, a vector of variables, X_I, that represent institutional characteristics that do not vary over time, a vector of variables

[6] F. King Alexander (2001) and Ronald Ehrenberg (2003)

that represent institutional characteristics that do *change* over time, Y_{it}, and an error term, ε_{it}.[7]

$$(3)\ CR_{it} = \alpha + X_i\beta + Y_{it}\delta + \varepsilon_{it}$$

In the log odds model, the dependent variable is specified to be the logarithm of the ratio of the continuation rate for an institution in a year to one minus the continuation rate for the institution in the year (LCR_{it}).

$$(4)\ LCR_{it} = \frac{CR_{it}}{1 - CR_{it}}$$

In each of these models, X_i, the vector of variables that do not change with time, is specified to include dichotomous variables for whether faculty at the institution are represented by a union (*UNION*), the form of control of the institution (*PRIV*), if the institution is associated with a church (*CHURCH*), and the highest degree granted by the institution (*PHD*, *MA*, *BA*). It is important to remember that because of the Supreme Court decision in the *Yeshiva* case collective bargaining for faculty in the United States is primarily a public sector phenomenon.[8] Hence the *UNION* variable will be zero for all private university observations and its coefficient will capture the impact of faculty collective bargaining coverage on faculty continuation rates in public universities. The X_i also includes a measure of the academic caliber of the institution's undergraduate students, measured by the mean SAT score (in 10s) of the institution's entering freshman class in 1996-1997 (SAT).[9]

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[7] Dichotomous variables are also included in the model to control for nonreporting of any of the explanatory variables.

[8] *NLRB V. Yeshiva University, 944 U.S. 672(1980)*

[9] Data regarding an institution's public or private nature, religious affiliation, and highest degree offered were all included in the AAUP data set. Faculty collective bargaining data come from Hurd and Forester (1997) and are for colleges and universities with unionized faculty in the 1996-1997 school year, the last

The vector Y_{it}, which encompasses those explanatory variables that vary for an institution over time, is specified to include the average associate professor compensation (wages and benefits) in thousands of dollars in the year (*COMP*), the percentage of associate professors at the institution that were tenured in a year (*TEN*) and the percent of associate professors that were female in the year (*FEM*); all of these variables come from the AAUP survey. Finally also included in the models are 6-year dichotomous variables, *Y96, Y97, Y98, Y99, Y00,* and *Y01,* to control for omitted year specific factors that might influence associate professor continuation rates (such as the cost of living and the nature of the academic labor market).

Table 1 presents the estimated coefficients obtained for both the variable and constant sample data sets, and for each data set, for both the linear and the log odds version of the model. Findings from these models are very similar across both data sets (constant and variable sample) and both model specifications (linear and logit).

Perhaps the most important finding from these results is that the average associate professor compensation level at an academic institution is positively related to its associate professors' continuation rates, other factors held constant; a result also found by Ehrenberg, Kasper, and Rees (1991). In particular, the linear probability function models imply that a $10,000 dollar increase in the average associate professor's compensation at an institution is associated with a 0.5 (0.8) percentage point increase in the institution's associate professor retention rate in the variable (constant) sample data.

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year such a study was published. The author calculated mean SAT data by averaging the 25th and 75th SAT percentile scores for incoming freshman in 1998-1999, taken from the *CEEB*'s Annual Survey of Colleges Standard Research Compilation, 1998-1999. When only ACT scores were reported, the author converted such scores into SAT scores using the conversion chart found at http://www.ccsd.edu/south/Guidance/satconversion.htm.

Other determinants were also found to be associated with an academic institution's associate professor continuation rate. Some associate professors are nontenured and are subject to involuntary termination. Not surprising then, the higher the percentage of associate professors that have tenure on a campus, the lower the turnover rate is among the institution's associate professors. Moreover, evidence from the variable sample models shows that an increase in the share of associate professors that are female at an institution is associated with a higher continuation rate, and thus a lower turnover rate for associate professors at the institution; however no statistically significant gender differences appear when the smaller constant sample is used.

All other factors held constant, including faculty compensation, continuation rates are about 1 to 2 percentage points higher at private academic institutions than they are at public institutions. This implies that some characteristics associated with the different institutional forms of control, be they institutional size or the extent of bureaucracies, make faculty more attached to private academic institutions than they are to public academic institutions. Thus, some of the differences in continuation rates between public and private institutions displayed in Figures 1, 2 and 3, are due to factors other than the differences in average compensation between the two types of institutions.

The constant sample results, but not the larger, variable sample results, suggest that all other factors held constant, including wage, institutions with faculty unions have higher continuation rates. Therefore, evident from these data, and echoing the findings of Rees (1994), having a faculty union is a nonpecuniary condition of employment that many faculty members value for more than just an increase in compensation. Neither the academic caliber of an institution's undergraduates, nor being a church related institution

is seen, however, to have any relationship to an institution's associate professor continuation rate.[10]

The coefficients on the highest degree level variables imply that all of the institutions that grant four-year degrees have lower continuation rates for full-time associate professors than do the two-year degree granting institutions (the omitted class). Among the four-year institutions, the lowest continuation rates, and hence the highest turnover rates for associate professors, are seen to be at the PhD granting institutions for all but one of the models. Faculty at the PhD granting institutions are likely to be more research oriented and to have more of a national market than their colleagues at more teaching oriented universities. Thus, they are likely to have higher voluntary turnover rates.

Finally, the coefficients of the year dichotomous variables (2001-2002 is the omitted year) reflect what we observed in the aggregate continuation rate data, namely that over the 6 year period associate professor continuation rates trended downward slightly by about 2.0 to 3.0 percentage points. In another words, voluntary turnover rates of associate professors increased slightly during the period.

IV. Concluding Remarks

The most important conclusion from this paper, which reiterates the findings of Ehrenberg, Kasper and Rees (1991) for the late 1980s, is that associate professor continuation rates are positively associated with the average level of compensation that associate professors receive. Holding other factors constant, including the public/private control of an institution, unionization of faculty, and the highest degree that the institution grants, a $10,000 increase in associate professor compensation is associated

[10] The former result was also found by Rees (1994)

with a 0.5 to 0.8 percentage point increase in its associate professor continuation rate and thus an equivalent decline in its associate professor turnover rate.

These estimates should be considered an upper bound of the improvement in associate professor continuation rates that an academic institution might expect to observe if it actually increased its faculty members' average compensation relative to its competitors' average compensation by $10,000. This is due to the fact that this analysis omitted other unobservable variables (such as lower teaching loads) that are most likely correlated with higher faculty compensation across institutions. Thus, part of what these estimates suggest are the effects of higher average compensation on continuation rates may actually reflect the effects of other conditions of employment, such as lower teaching loads. Increasing average faculty compensation at an institution without also simultaneously reducing its faculty members' teaching loads would thus likely lead to a smaller increase in its faculty continuation rate than our estimates suggest.

In 2000-2001, the difference between the average compensation of associate professors at private doctoral and public-independent doctoral institutions was in the range of $13,500.[11] The estimates found in this paper suggest that if public doctoral universities were to increase their average associate professor compensation level by $10,000 and substantially close this gap, they would at most increase their associate professors continuation rates by about 0.8 percentage points, which would still leave them with a lower average continuation rate than that of their private counterparts (Figure 1). Put another way, for each 100 associate professors that they employed, it would cost them an extra $1 million a year in faculty compensation to reduce their associate professors' turnover by one percent. It is highly unlikely that these hypothetical actions

[11] Linda Bell (2001), table 4

would make sense for such institutions to engage in. Lower average faculty salaries at public universities may influence the ability of public academic institution to hire the very best faculty but they do not appear to *substantially* influence their existing faculty members' turnover rates.

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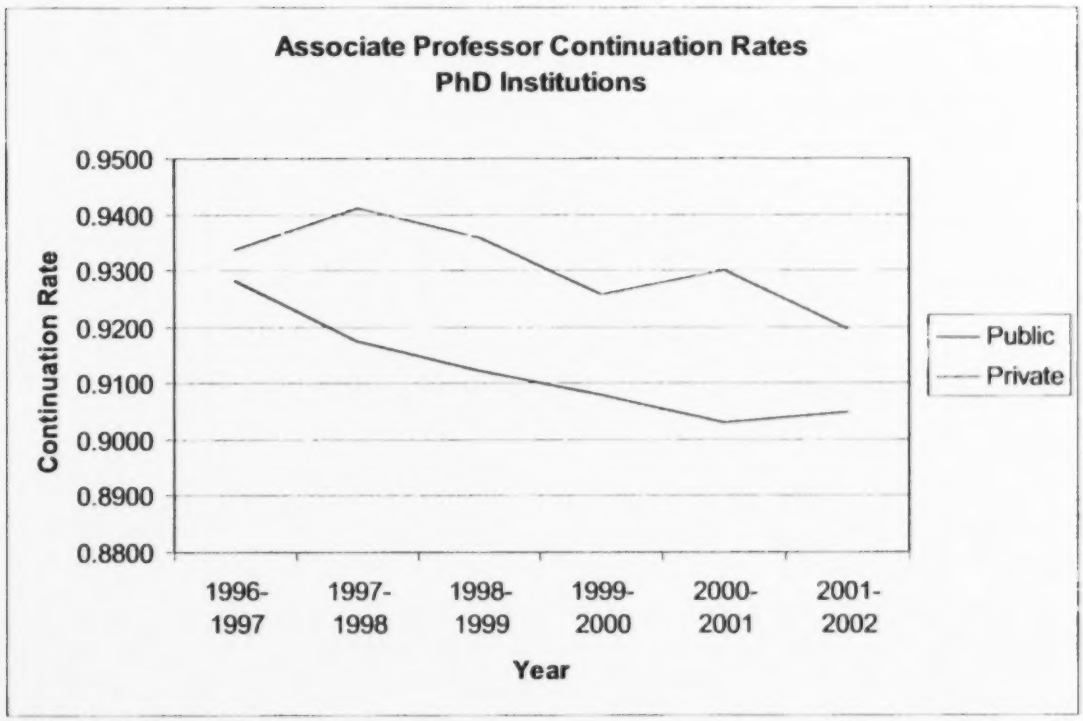
Average Continuation Rates – Constant Sample
Figure 1



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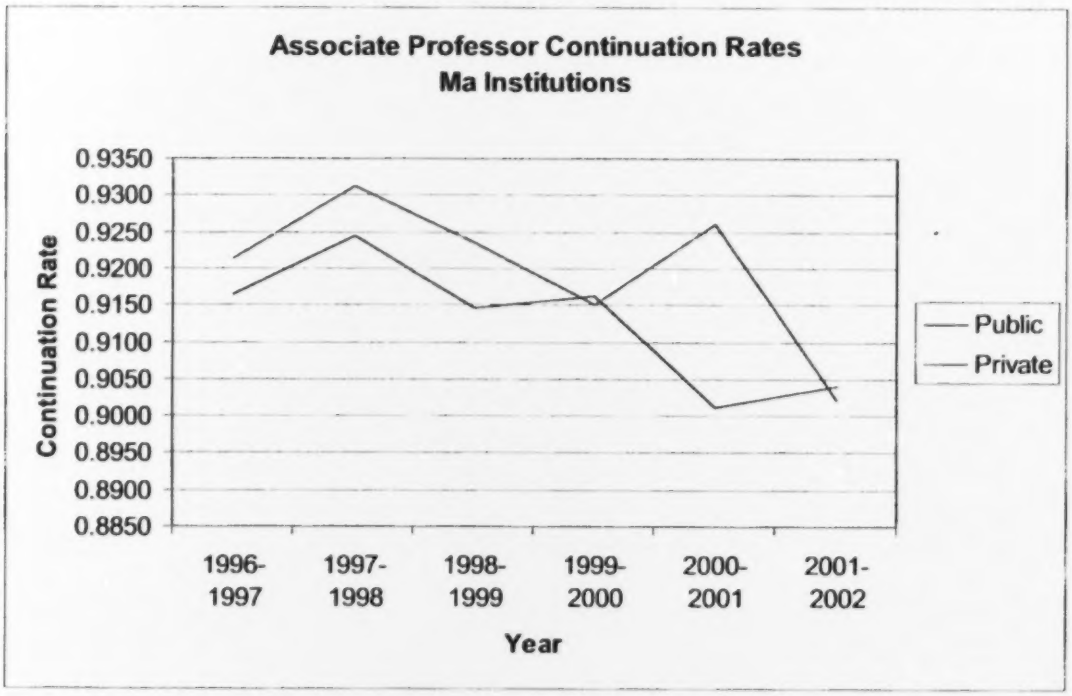
Average Continuation Rates – Constant Sample
Figure 2



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Average Continuation Rates – Constant Sample
Figure 3

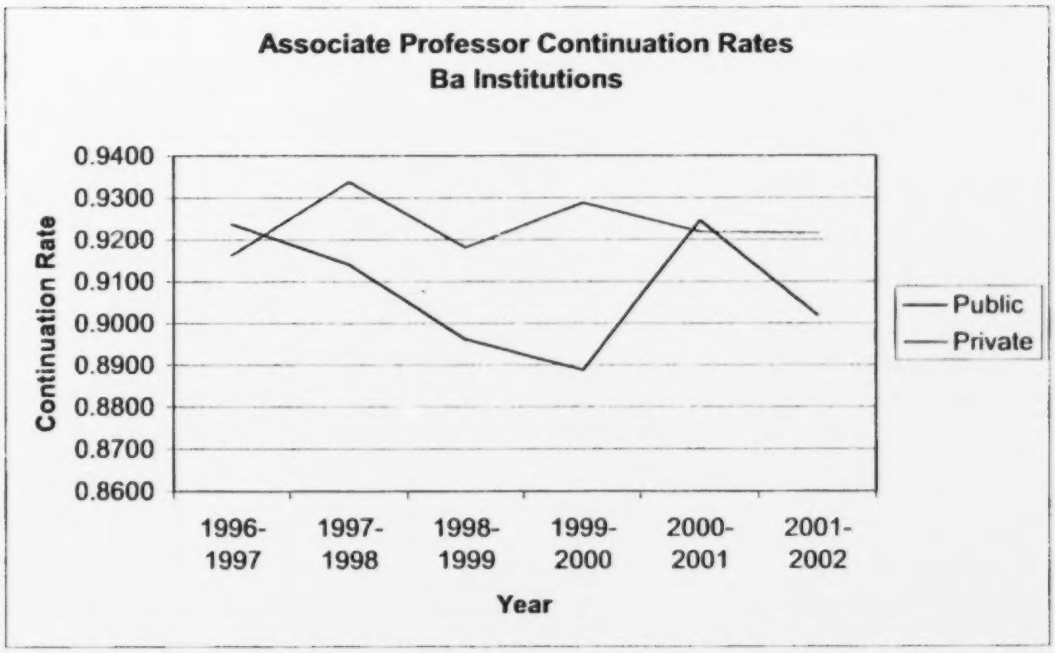

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Table I
Determinants of Associate Faculty Continuation Rates
Weighted Regression Equations (absolute value t statistics)

Variable	Variable Sample		Fixed Sample	
	CR_t	LCR_t	CR_t	LCR_t
CONS	**0.8276** (48.8)	**1.157** (4.84)	**0.8175** (23.6)	**1.7975** (3.83)
COMP	**0.0004** (2.8)	**0.0049** (2.57)	**0.0008** (2.9)	0.0069 (1.88)
TEN	**0.0008** (9.3)	**0.00964** (8.65)	**0.0010** (6.65)	**0.0122** (5.92)
FEM	**0.0346** (3.0)	**0.4082** (2.5)	0.0363 (1.51)	-0.2098 (0.64)
UNION	0.002 (0.74)	0.0315 (0.84)	**0.0090** (2.00)	**0.1532** (2.40)
SAT	0.000005 (0.4)	0.0001 (1.07)	-0.0002 (0.3)	-0.0004 (1.32)
PRIV	**0.0178** (5.2)	**0.2384** (4.97)	**0.0235** (3.93)	**0.4034** (4.71)
CHUR	0.0011 (0.3)	0.0434 (0.85)	0.0007 (0.11)	0.0676 (0.74)
PHD	**-0.0287** (5.0)	**-0.2811** (2.99)	**-0.0541** (3.9)	**-0.5131** (2.76)
MA	**-0.0274** (4.3)	**-0.1845** (2.02)	**-0.0476** (3.51)	**-0.4649** (2.54)
BA	**-0.0186** (3.92)	**-0.2304** (2.9)	**-0.0420** (2.95)	**-0.5149** (2.66)
Y96	**0.0212** (5.74)	**0.2794** (5.5)	**0.0289** (4.32)	**0.2814** (3.13)
Y97	**0.0114** (3.21)	**0.1357** (2.8)	**0.0239** (3.8)	**0.2202** (2.6)
Y98	0.005 (1.45)	0.0888 (1.86)	**0.0145** (2.48)	0.1153 (1.44)
Y99	**0.0072** (2.14)	**0.0892** (1.95)	0.0107 (1.89)	0.0854 (1.12)
Y00	0.0007 (0.2)	0.044 (0.5)	0.0036 (0.66)	-0.0148 (0.2)
r^2	0.0693	0.0717	0.1421	0.1198
n	3430	2974	1074	998

* Equation weighted by the square root of the number of faculty in year *t*. Coefficients that are statistically significant at the 95% confidence interval in bold. Also included in equation(s) are dichotomous variables for the reporting of tenure status and SAT score to control for non-reporting institutions, where 1 = not reported, 0 = reported.

CR_t	continuation rate of associate professors in institution in year *t*, found by dividing number of continuing associate professors in year by the number of associate professors in the year *t-1*
LCR_t	log odds of the **CR**
CONS	Intercept of Regression Equation
COMP	average compensation of the associate professors in institution, reported in thousands of $ in year *t*
TEN	percent associate faculty tenured in institution in tear *t*
FEM	proportion associate faculty female in institution in tear *t*
UNION	1 = faculty unionized at institution, 0 = no union
SAT	Mean SAT of entering freshman at institution, measured in tens
PRIV	1 = private institution, 0 = other
CHUR	1 = church affiliated institution, 0 = other
PHD	1 = PhD (highest degree) granting institution, 0 = other
MA	1 = Ma (highest degree) granting institution, 0 = other
BA	1 = Ba (highest degree) granting institution, 0 = other

two-year institutions are omitted variable

Y96	1 = observation from academic year 1996-1997, 0 = other
Y97	1 = observation from academic year 1997-1998, 0 = other
Y98	1 = observation from academic year 1998-1999, 0 = other
Y99	1 = observation from academic year 1999-2000, 0 = other
Y00	1 = observation from academic year 2000-2001, 0 = other

academic year 2001-2002 omitted variable

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Appendix Table 1
Number of Institutions in AAUP Study Compared to This Study
By Institutional Characteristics

Category	Variable Sample		Constant Sample	
	AAUP	Study	AAUP	Study
All	8479	3502	8479	1086
Public	4021	1665	4021	702
Private	4458	1837	4458	384
Phd	1210	708	1210	336
Ma	2486	1146	2486	438
Ba	3323	1347	3323	258
TwoYear	1460	301	1460	54
Phd - Public	839	502	839	234
Phd - Private	371	206	371	102
Ma - Public	1304	623	1304	300
Ma - Private	1182	523	1182	138
Ba - Public	577	257	577	114
Ba - Private	2746	1090	2746	144
TwoYear - Public	1301	283	1301	54
TwoYear - Private	159	18	159	0

AAUP Number of Institutions (n) in Original AAUP Data
Study Number of Institutions (n) used to Calculate CR in this Study
All All Institutions in Study
Public Public Institutions of Higher Education
Private Private Institutions of Higher Education
Phd Institutions where the Highest Degree Granted is a Doctorate
Ma Institutions where the Highest Degree Granted is a Masters
Ba Institutions where the Highest Degree Granted is a Bachelors
TwoYear Two Year Institutions of Higher Education

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